Spontaneous bone fractures in a goat: a consequence of copper deficiency?

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Introduction. Copper (Cu) is essential for all animals. Sheep are prone to copper intoxication. For this reason mixed feed for sheep is low in copper. However, feed industry offers mixed feed for small ruminants, that means sheep, as well as goats.. Furthermore, often sheep and goats are kept together on farms. This is a risk for copper deficiency in goats as they need a higher copper supply than sheep.
Case. A goat of the breed “Bündner Strahlenziege” had a bone fracture of the phalanx media of the left hind leg at the age of two months. After treatment with a tube bandage, the fracture healed. At the age of four months in the same goat a fracture of the Ossa metatarsalia III and IV was diagnosed. After 8 weeks with a tube bandage no healing process could be seen and the animal was euthanized. The hair of this goat was brownish and a little curly and the circulating serum^m copper content was 26µg/dl (reference: 80-111µg/dl) and the liver copper content accounted for 9.1mg/kg (reference: 25-150mg/kg). An osteoporosis was diagnosed with help of a bone mineral density (BMD) measurement by pQCT (Peripheral Quantitative Computed Tomography). The BMD of the Ossa metatarsalia II and IV was distal total 188mg/cm^3 and distal trabecular 79mg/cm^3 (reference: 419mg/cm^3 and 396mg/cm^3, respectively). Pathological-anatomical and histological a missing of an osseous bridging structure of the fracture gap was determined. The feeding of the small hobby goat herd consisted of meadow grass, hay of unknown origin and a mineral supplement (UFA 998) for small ruminants without copper.
Discussion. Although, the copper content of the whole ration of the goats is not known precisely, a copper deficiency is assumed in the affected goat. Mostly young animals show signs of copper deficiency like weakness, light hair, lameness, ataxia and spontaneous fractures [1,2]. The measurement of the liver copper content is a useful diagnostic tool. Possible explanations could be a low copper content in roughage (<10mg/kg DM) causing a primary copper deficiency [3] or a high content of molybdenum in roughage causing a secondary copper deficiency [2].
Conclusion. As a consequence of this case, under Swiss conditions, goats fed with hay of unknown copper and molybdenum content should always be supplemented with a mineral supplement for goats with copper addition.
References: [1] Goonerate et al. (1989) Can. J. Anim. Sci. 69: 819-845; [2] Camenzind et al. (2003) Tieräztl. Prax. 31: 330-335; [3] Périgaud et al. (1972) Fourrages 52: 11-37.